Decentralization of River Basin Management in Mozambique, South Africa and Zimbabwe: An Institutional Economics Analysis

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Abstract

Southern African countries have been experienced several problems regarding the management of their river basins. In order to mitigate these problems, during the past 15 years, most of the SADC countries have adopted comprehensive reforms in the water sector towards decentralization of river basin management through changing water related institutions. However, the impact of those institutions on decentralization process of river basin management is still largely unknown. Understanding the impact of institutions on decentralization process of river basin management could be of important value for policy makers and water managers. This paper analyses the impact of institutional factors on river basin decentralization process and its performance. The paper uses an institutional economic framework, where institutional factors are broken down into contextual factors and initial conditions; characteristics of decentralization process; characteristics of central government/basin-level relationships and capacities; and internal configuration of basin level institutional arrangements. The impact of the institutional reforms on decentralization process and performance of river basin management is studied by accessing the level of decentralization of Limpopo (Mozambique), Inkomati (South Africa) and Mzingwane (Zimbabwe) river basins given the institutional factors in the respective countries. The study uses secondary data collected from different sources and primary data collected from a survey conducted in the three river basins in the studied countries. The analysis show mixed results. While the Inkomati river basin is more decentralized, the decentralization process of Mzingwane and Limpopo river basins is lagging behind. Institutional factors showed to be determinants in river basin decentralization process and its performance. The advancement of decentralization process and its performance in Inkomati river basin is associated with the endowment of financial capacity as well as the involvement of river basin stakeholders in decentralization process, while the failure of decentralization process in Mzingwane and Limpopo river basins is mainly associated with top-down approaches used in decentralization process in these basins as well as the lack of financial endowment.

Keywords: Decentralization process; Decentralization performance; Institutional factors; River basin management.

Target sub-theme: Water Resource Management
Type of presentation: Oral

1 Introduction

Sub Saharan countries have been experiencing serious problems regarding the management of their river basins. Such problems include inequality in access to water, limited financial and capacity at national and basin levels for river basin management, poor river basin infrastructure and service delivery, declining quality and quantity of the river basin natural resources, limited stakeholders involvement in the basin management, institutional fragmentation, conflicting sector policies, impacts of recurrent droughts/floods and increasing number of conflicts among stakeholders (Swatuk, 2005).

In order to address these problems, during the past 25 years, most Sub Saharan African countries have adopted a comprehensive reform in the water sector towards integrated water resources management (IWRM). Decentralization of water management is one of the key reform items contained in the concept of Integrated Water Resource Management (IWRM), and most Sub Saharan countries have adopted it (Sokile, Mwaruvanda and van Koppen, 2005). This study use a sample of three Southern African selected river basins, Inkomati in South Africa, Limpopo (Mozambican part) in Mozambique, under the responsibility of the ARA-Sul agency, and Mzingwane (which is the Zimbabwean component of Limpopo) in Zimbabwe to outlook water governance and decentralization process in Sub Saharan river basins.

For example, the South Africa's National Water Act (NWA) approved in 1998 created new organizational setups in river basin management through the creation of Catchment Management Agencies (CMAs), and more locally by the establishment of Water Users Associations (WUAs). Similar to South Africa, Zimbabwe repealed the 1976 Water Act and initiated the design of laws and policies towards decentralization of water management. In 1998, the Zimbabwean government promulgated the Water Act and the Zimbabwe National Water Authority (ZINWA) Act. The new Acts created new organizational setups through the creation of catchment and sub-catchment councils to manage seven major river basins (Save, Sanyati, Mazowe, Runde, Mzingwane, Gwayi and Manyame) identified in the country.

Likewise, Mozambique approved the first National Water Law in 1991 (DNA, 1999). The same law established the National Water Council for inter-sector coordination and five Regional Water Administration Agencies (ARAs) to manage regional river basins. The five ARAs are ARA-Sul, ARA-Zambeze, ARA-Centro, ARA-Centro Norte and ARA-Norte. Furthermore, the Mozambican government approved the national water policy in 1995 (DNA, 2007). This revised legal framework allowed leaders of local communities to be involved in all stages of water supply projects, in order to express community's needs, desires and preferences in the selection of the type and level of services required, and the form of investment in the water sector (DNA, 2001).

As described above, reforms in the water sector towards the implementation of integrated water resources management (IWRM) in Mozambique, South Africa and Zimbabwe have substantially changed the institutional settings governing the water sector in these countries. These settings have been documented extensively within specific contexts and perspectives of other countries (Vermillion, 1997; Savedoff & Spiller, 1999; Challen, 2000; Shirely, 2002 and Saleth & Dinar, 1999, 2000, 2004; 2009). However, there is no evidence of existing studies that use an institutional economics framework to understand the river basin decentralization process and its performance in Sub Saharan countries[1].

For example, Southern Africa Development Community (SADC) countries have adopted comprehensive institutional reforms in the water sector, recent studies that have been undertaken in Mozambique, South Africa and Zimbabwe present the organizational structure of water sector and review the policies that have been undertaken towards decentralization of water management (Magaia, 2009; Backeberg, 2005; Karar, 2002; Wester, 2003; Manzungu and Kujinga, 2002). However, the impact of these reforms on river basin decentralization process and its performance is still largely unknown. A cross-country analysis which aims to understand the impacts of institutional factors on the dynamics of changes in river basin decentralization and its performance could be of important value for policy makers and water managers. From a policy and applied point

[1] Saleth and Dinar (2000) analyzed the trends of decentralization process in South Africa and Backeberg (2005) described the water institutional reforms in South Africa. None of these studies evaluated river basin decentralization process and its performance in South Africa using an institutional economic framework

of view, this paper will highlight factors that affect the outcomes of decentralization process and its performance and give practical recommendations to governments and river basin stakeholders to what they must do to achieve integrated water resource management through decentralization.

This paper aims to assess the river basin decentralization process and its performance under varying institutional setting in Mozambique, South Africa and Zimbabwe. The specific objectives of the paper are to:

1. Describe the factors that are potentially related to the development of decentralized river basin management in Sub Saharan countries focusing in South Africa, Mozambique and Zimbabwe.
2. Depict the factors that are potentially related to the performance of decentralized river basin management in Sub Saharan countries concentrating on South Africa, Mozambique and Zimbabwe.

The paper is divided into six sections. The next section provides a literature review. The third section describes the analytical framework. The fourth presents the data collection method, empirical framework applied in the paper and the methods used for to analyze the data. The results are presented in the fifth section and section six highlights the conclusions derived from the studied river basins and their policy implications.

2 Literature Review

Decentralization[2] of water resource management to the lowest appropriate level has become a major component of recent water reforms around the world. Academics, policy makers and national and international donor agencies as well as non government organizations (NGOs) have all been working on water projects with decentralization components. Empirical evidence from river basins in the developed and developing world shows that decentralization of water management has determined tremendous achievements in conflict and pollution reduction, productive and allocative efficiency, and environmental sustainability (Blomquist, Calbick and Dinar 2005; Blomquist et al. 2005a; 2005b; Blomquist, Tonderski and Dinar 2005; Dinar et al., 2005). Likewise,

[2] Following Dinar et al. (2007) in this study decentralization is defined as the redistribution of power and allocation of resources with more authority being shifted away from the central government level to lower levels of government.

Wester, Burton and Mestre-Rodriguez (2001) in the Lerma-Chapala Basin, Mexico also noted that water governance decentralization led to sustainable water resource management, enhanced water services and integrated watershed management.

Although decentralization of water management was reported to produce positive impact, some scholars argue that in various cases it has negative consequences. Stalgren (2006) argues that political entrepreneurs at the national level strategically position themselves by influencing the 'construction of reality' in matters of water governance decentralization at the local level to their advantage. Smith (1983) and Fesler (1968) also argue that decentralization promotes parochial and separatist tendencies and may deepen enclaves of authoritarianism as well as exacerbate inequalities. Kambudzi (1997) states that democratization of water may go beyond our intention and turnout to be a recipe for further disaster. Finally, Helmi (2001) showed through a study carried out in the Indonesian province of Central Kalimantan that decentralization processes at the national, district and village levels led to highly volatile socio-legal configurations that created insecurity.

In the light of these mixed views on decentralization in water governance, it can be concluded that the outcome from the decentralization process of water management often depends on the manner in which the process is operationalised. Blomquist, Dinar and Kemper (2005) argue that the whole process of success or failure of decentralization is context specific as it can be affected not only by political will but also by a host of other interconnected factors that could be historical, legal, social, cultural, physical or institutional in nature.

While for the Australian Murray-Darling basin (Blomquist et al., 2005b), the Brazilian Jaguaribe basin (Johnsson and Kemper, 2005) and the Indonesian Brantas basin (Blomquist, Ramu and Kemper, 2005) stakeholder involvement might have translated significantly into effective river basin management, in the Costa Rican basin of the Tarcoles and the Spanish basin of Guadalquivir, an interesting observation was made: in these two catchments decentralization was compromised significantly by translation of stakeholder participation into 'stakeholder protectionism' wherein a dominant group of

stakeholders use their numbers and privilege to participate to their selfish advantage. For instance, in the Spanish Guadalquivir basin, irrigators constituted a significant number of the stakeholders and they consumed most of the water yet they were exempted from paying water tariffs (Blomquist et al., 2005c). The same scenario prevailed in the Costa Rican Tarcoles basin where hydro-power producers made the most non-consumptive use of water yet they did not pay water tariffs (Blomquist et al. 2005a).

While other issues are context specific, from the available international and local literature it seems that the majority of the cases of failure have communication problems at the core. Blomquist, Tonderski and Dinar (2005) state that the way in which communication regarding decentralization takes place is the key factor determining the outcome of decentralization process. Through their work in the Guadalquivir River Basin, Spain, they have noted that the decentralization process could have yielded good results if communication with key stakeholders was established (Blomquist et al., 2005c). In the same vein, Sithole (2000) and Manzungu (2001) report that in Zimbabwe, communication hampered effective participation by marginalizing groups through use of an alien (foreign) language, alien practices and information asymmetry. Additionally, being looked down upon as being ignorant by other better-off stakeholders modeled the context in which the marginalized groups were further marginalized in the Zimbabwean Lower Gwayi sub-catchment.

2.1 Institutional Economic Approaches Applied to the Water Sector

The common approach that has been used to analyze decentralization reforms of river basin management is the case study approach (Blomquist, Dinar and Kemper, 2005; Ioris, 2001; Kemper and Olson, 2000). Studies that include quantitative analysis of river basin decentralization reforms are lacking except the work by Dinar et al. (2007) and Saleth and Dinar (2004). A detailed theoretical framework for analyzing water sector is described by Saleth and Dinar (2004), Blomquist, Dinar and Kemper (2005), Dinar et al. (2007) and Blomquist, Dinar and Kemper (2008). In this section we describe the theoretical institutional framework proposed by the above mentioned authors.

Saleth and Dinar (2004) use institutional decomposition and analysis (IDA) framework to analyze the performance of water sector. Figure 1 below shows the factors which affect water sector performance based on IDA framework. The application of IDA framework is performed in four different steps. The first step is the definition of water sector, water institutions and water sector performance. Secondly, water institutions and water sector performance are decomposed to identify their major components.

As shown in figure 1 below, the main components of water institutions are water law, water policy and water organizations. Within each component of water institutions are subcomponents. Saleth and Dinar (2004) identified four indicators of water sector performance as follows: (a) physical performance composed by the following sub indicators: demand-supply gap, physical health of water infrastructure, conflict resolution efficiency and smoothness of water transfer across sectors, regions and users; (b) financial performance which made up of the following indicators: investment gap (actual vs. required) and financial gap (expenditure vs. cost recovery); (c) economic efficiency which is composed of the following sub indicators: price gap (water price vs. supply cost), incentive gap (actual water prices vs. scarcity value of water); and (d) equity performance which is composed by the following sub indicators: equity between regions, equity between sectors and equity between groups.

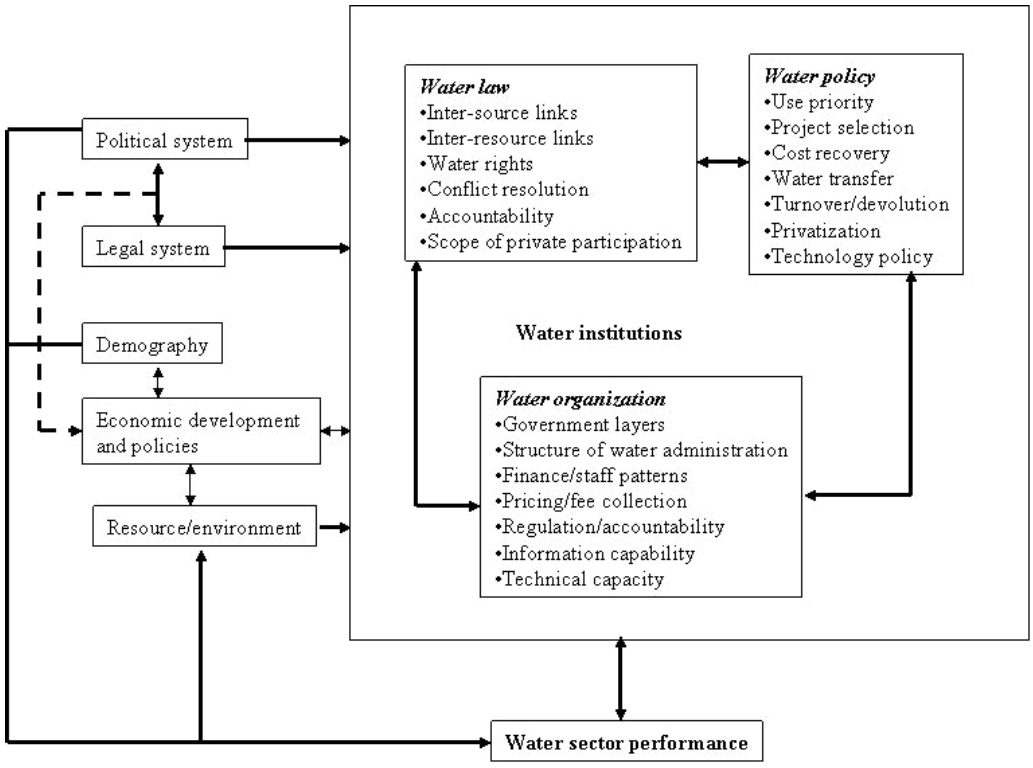

Figure 1. Factors affecting water sector performance and their interaction.
Source: Adapted from Saleth and Dinar (2004)

At the third stage, after the decomposition of water sector performance and water institutions, the analytical linkages among water institutional aspects are demonstrated and the influence of exogenous factors on institutional aspects and water sector performance is illustrated. Figure 1 above shows that water sector performance is affected by water institutions and other factors outside the water sector. The arrows show the interactions among water institutions, other factors outside water institutions and water sector performance. Some of these linkages have direct and immediate effect while others have indirect effects. At the last stage, specific variables are defined to represent institutional, performance and exogenous aspects. For a detail of institutional, performance and exogenous aspect variables which can be used in water sector, see Saleth and Dinar (2004).

Blomquist, Dinar and Kemper (2005); Dinar et al. (2007); and Blomquist, Dinar and Kemper (2008) identify a number of political and institutional factors which may be

associated with the emergence, sustainability and success or failure of decentralization initiatives of the river basins at the basin level. The various factors identified by the framework are derived from the institutional analysis literature relating to water and other natural resource management and to decentralized systems of governance (Agrawal, 2002; Alaerts, 1999; Bromley, 1989; Easter and Hearne, 1993). The four major factors are: (a) contextual factors and initial conditions, (b) characteristics of decentralization process, (c) characteristics of central government/basin-level relationships and capacities, and (d) internal configuration of basin level institutional arrangements. Figure 2 below represents the theoretical framework proposed by Blomquist, Dinar and Kemper (2005), Dinar et al. (2007) and Blomquist, Dinar and Kemper (2008).

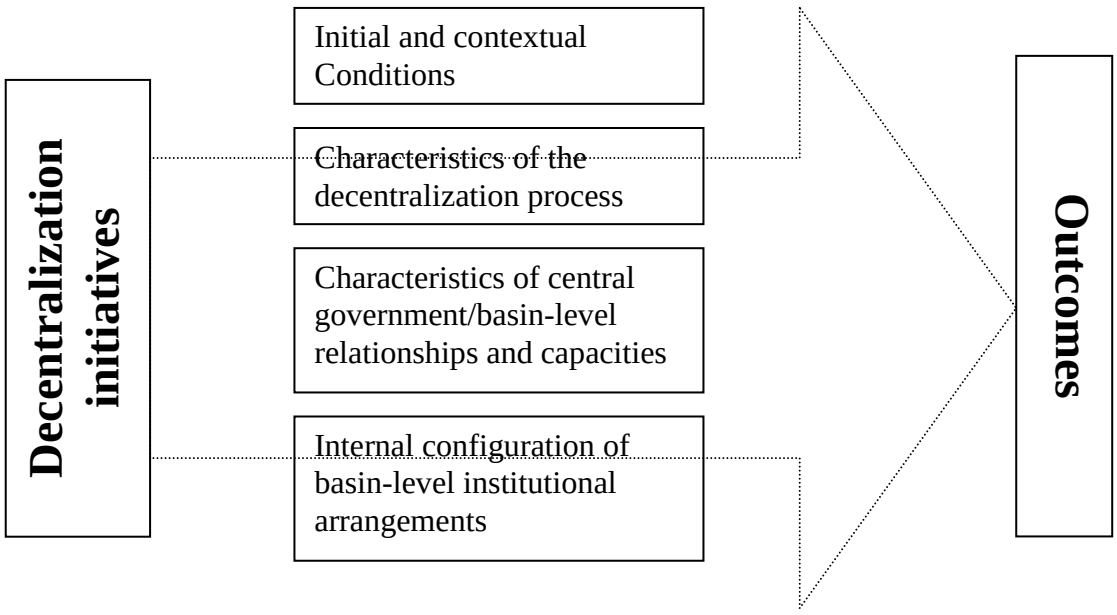

Figure 2. Diagram of theoretical framework. Source: Adapted from Dinar et al. (2007)

As shown in figure 2 above, for a river basin decentralization process, there are various factors, mainly those listed in the scheme, that will influence the outcome of the decentralization initiative. It is necessary to note that these factors are not directly linked to the decentralization initiative success or failure, but influence incentives and conditions that are linked to the success or failure of basin management. In the following

paragraphs we describe the factors appearing in figure 2 above and their impact on the outcomes of river basin decentralization initiatives (Blomquist et al. 2008).

Contextual Factors and Initial Conditions: Empirical evidences from natural resource management studies suggest that the initial conditions, which are primarily elements of the socio-economic setting that prevailed at the time when decentralization initiative was attempted, represent an integral component and determining factor in the outcome of decentralization efforts. Pre-identified factors and conditions include: (a) the level of economic development within the nation, (b) the level of economic development within the catchment area, (c) the initial distribution of resources among basin stakeholders (d) the socio-cultural diversity among basin stakeholders, and (e) the local experience with self-governance and service provision.

Musgrave (1997) found that the level of economic development of the nation was associated with successful decentralization in water sector. According to Blomquist, Dinar and Kemper (2005), the level of economic development of the nation is a key variable since it affects the financial capacity of the central government to bear transition costs associated with decentralization initiative and ongoing costs that support and facilitate basin scale management. The initial distribution of resources among basin stakeholders has been reported as a key variable affecting decentralization initiatives. Studies on natural resource management have also indicated that the initial distribution of resource among river basin stakeholders is crucial factor affecting decentralization process.

Heterogeneous societies and particularly those with weak formal and informal institutions have lower trust and retarded economic performance compared to less heterogeneous societies. Social and cultural diversity among stakeholders is an important factor, which may affect decentralization initiative outcome since it may affect communication and trust. Blomquist, Dinar and Kemper (2005) have pointed out that the ability of managing water resources will more likely depend on river basin stakeholders previous experience with other public services.

Dinar et al. (2007) also found that contextual factors and initial conditions affect significantly the nature of decentralization process and its performance. However, their results do not support that reach and well-endowed basin do necessarily have an advantage over less endowed basins. Their results indicated that stressed resource conditions (persistent water scarcity and quality) and the existence of multiple major problems can stimulate action towards decentralization reforms.

Characteristics of the Decentralization Process: The main components affecting the outcomes of decentralization reforms include devolution of authority and responsibility from the centre, and acceptance of that authority and responsibility at the local level. Key factors include: (a) the type of devolution of decentralization process (top-down, bottom-up and mutually desired), (b) incorporation or involvement of existing local governance arrangements and (c) consistent central government commitment.

The type of devolution of decentralization process has been found to affect decentralization initiatives and their performance. In this regard, Blomquist et al. (2005a) report that bottom-up decentralization initiatives often lack a well defined legal role and mandate. On the order hand, Dinar et al. (2007) found that decentralization process, which is initiated by central government (top-down devolution), is likely to be inefficient and end in lower levels of decentralization performance. Empirical evidence has shown that a highly conflictual decentralization initiative was associated with poorer performance (Dinar et al., 2007). In order to have an efficient decentralization initiative, responsibility should be given to a level where stakeholders are empowered to participate in decision making about the management of the scarce resource (Van Wilgen et al., 2003; Dinar et al., 2007). Therefore, successful implementation of a decentralization initiative may depend significantly on the devolution of authority and responsibility from the centre, and acceptance of the authority and responsibility by local stakeholders in the basin (Kemper, Blomquist and Dinar, 2007).

Similarly, in order to reach integrated water resource management a broad cross section of stakeholders need to be involved to varying degrees in the planning, development, implementation and monitoring of water management activities given that participatory

approaches enhance quality, ownership and sustainability of integrated water resource management and decrease water conflicts. Blomquist, Dinar and Kemper (2005) report that stakeholder participation in decentralization initiative is likely to increase and be stable if local community governance institutions and practices are recognized and incorporated in decentralization process. The same authors note that a change in country's government during decentralization process might produce changes in the decentralization policy, which can confuse the mission of government agencies involved in the decentralization process.

Characteristics of Central Government/Basin-level Relationships and Capacities: As we described above, the success of decentralization initiatives seems to be a joint effort performed by the central government and local level government. In this section we identify other variables related to central-local government relationships. According to Blomquist, Dinar and Kemper (2005), these variables are: (a) The extent of actual devolution; (b) financial resources and autonomy at the basin level, (c) basin level authority to modify and create institutional arrangements, (d) distribution of national level political influence among stakeholder, (e) characteristics of water right system and (f) adequate time for implementation and adaptation.

Blomquist, Dinar and Kemper (1995) report that decentralization process announced by the government can be symbolic (written documents advocating participation of local stakeholder while in practice the government has control over significant resource management decisions). Vermillion and Garces-Restropo (1998) found that symbolic and abandonment policies are more likely to result in low performance of decentralization process.

Dinar et al. (2007) found that basin with higher budget per capita are not necessarily more successful and Blomquist, Dinar and Kemper (1995) also note that basin level authority should be endowed with resource and have authority over those resources but a complete transfer of financial responsibility from central government to local authority might produce undesirable results. Dinar et al. (2007) conclude that a combination of financial responsibility given to local authorities, financial autonomy (basin revenues

remaining at the basin-level) and central government support is more likely to increase the performance of river basin decentralization process.

Finally, basin level authority to modify and create institutional arrangements is a key variable since the ability of local authority to design their own institutional arrangements is more likely to attract more active involvement from basin-level stakeholders (Blomquist, Dinar and Kemper, 2005). The same authors report that the relationship between time for implementation of decentralization process and the success of decentralization is complex. However, adequate time is needed to adjust changes and stabilize the decentralization process.

Internal Configuration of Basin-level Institutional Arrangements: Basin-level and local-level institutional arrangements established by basin-level stakeholders and/or central government officials make up the final set of variables deemed critical in the successful implementation of river basin decentralization initiative. Indicators falling under this category include: (a) presence of basin-level governance institutions, (b) clarity of institutional boundaries, and their match with basin boundaries, (c) recognition of basin-level communities of interest by basin-level institutional arrangements, (d) availability of forums for information sharing and communication and (e) availability of forums for conflict resolution.

Regarding the first indicator, Ostrom (1990) has indicated that the presence of basin-level governance institutions is a key variable to sustain successful resource preservation and efficient use. The same author has found clarity of institutional boundaries, and their match with basin boundaries, to be a feature of long-enduring common-pool resource management. The recognition of basin-level communities of interest by basin-level institutional arrangements is key variable since it is likely to increase the participation of river basin stakeholders in decentralization process. Forums for sharing information and communication as well as forums for conflict resolution are key variables affecting decentralization performance since their reduce information asymmetries and promote cooperation.

3 Analytical Institutional Economic Framework

The analytical model is based on the model developed by Blomquist, Dinar and Kemper (2005), Dinar et al. (2007) and Blomquist, Dinar and Kemper (2008) and depicted by figure 2 above. This approach is appropriate here since it includes various institutional variables and their possible impact on the outcome of the decentralization reform. The approach allows for micro level analysis, given that it is capable at analysing a decentralization process and performance at a single river basin level. As described in the introduction section of this study, the main objective of this study is to access the river basin decentralization process and its performance under varying institutional settings in Mozambique, South Africa and Zimbabwe.

The relationship between river basin decentralization process and institutional variables is given as:

$$D = f(C, G, I, X) \quad , \tag{1}$$

where *D* represents a vector of variables indicating the characteristics of the river basin decentralization process (such as length of decentralization, number of institutions created and dismantled, etc.), *C* is a vector of variables representing contextual factors and initial conditions involved in the reform process (such as river basin GDP and revenues), *G* is a vector of variables representing the characteristics of central government/basin-level relationships and capacities (such as the nature of distribution of river basin management responsibilities), *I* is a vector of variables indicating internal configuration of basin-level institutional arrangements (such as the organgram of the basin organization) and *X* is a vector of other variables associated with the specific river basin (such as river basin size, population etc.).

Following Dinar et al. (2007), we evaluate decentralization process (vector D in equation 1 above) using the following variables: (i) the length of decentralization process, (ii) the transaction costs of the decentralization process measured by several variables such as institutions created and dismantled during decentralization process and (iii) the level of involvement of the river basin stakeholders in the decentralization process.

Contextual factors and initial conditions (vector C in equation 1 above) can be indicated by the following variables: (a) the level of economic development within the nation, (b) the level of economic development within the catchment area, (c) the initial distribution of resources among basin stakeholders (d) the socio-cultural diversity among basin stakeholders and (e) the local experience with self-governance and service provision. Being everything equal, we expect economically developed basins to achieve a successful decentralization process than not economically developed basins. Moreover, holding everything else constant, we also expect basins with homogeneous societies and particularly those with strong formal and informal institutions to have a successful decentralization process compared to basins with heterogeneous societies and with weak formal and informal institutions.

According to Blomquist, Dinar and Kemper (2005), the variables under the category of characteristics of central government/basin-level relationships and capacities (vector G in equations 1 above) are: (a) the extent of devolution of responsibilities and decision making; (b) financial autonomy and financial resources at the basin level, (c) basin level authority to modify and create institutional arrangements, (d) distribution of national level political influence among stakeholders, (e) characteristics of water right system and (f) adequate time for implementation and adaptation. All other things being equal, we expect decentralization process to be successful when autonomy and or flexibility (technical and financial) are given to local river basin organizations. Additionally, holding everything else constant, decentralization process is expected to succeed if complete central government funds be managed by central government and complete local-river basin funds being managed by local-river basins. Finally, everything else being equal, we expect success on river basin reforms if local stakeholders are able to create and implement institutional arrangements for resource managements including cross-jurisdictional arrangements.

Internal configuration of basin-level institutional arrangements is indicated by the following variables: (a) presence of basin-level governance institutions, (b) clarity of institutional boundaries, and their match with basin boundaries, (c) recognition of basin-level communities of interest by basin-level institutional arrangements, (d) availability of

forums for information sharing and communication and (e) availability of forums for conflict resolution. Holding everything else equal, we expect the decentralization process to be successful when information sharing and communication among stakeholders are apparent. Without influence of other things, we also expect to have a decentralized water resource management more likely in settings where forums for conflict resolution exist.

The relationship between river basin decentralization performance and institutional variables is given as:

$$P = g(C, D, G, I, X) \tag{2}$$

Where P is a vector of river basin decentralization performance indicators and the other variables are defined as described above.

We assess the river basin decentralization performance[3] using the following variables: (a) the level of accomplishment of the river basin objectives, (b) the degree at which stressed resource conditions have been affecting the river basin stakeholders before and after the decentralization process and (c) the level of authority given to different stakeholders to manage river basin resources before and after the decentralization process. We expect high decentralization performance if the objectives of decentralization process were accomplished, if the condition of the stressed river basin resources has been improved and if more river basin management decisions are made at lower levels after the decentralization than before decentralization.

The main variables serving as the contextual factors and initial conditions including the characteristics of the river basin decentralization process, characteristics of central government/basin-level relationships and capacities as well as internal configuration of basin-level institutional arrangements are those described above.

In respect to the characteristics of decentralization process, holding everything else equal, we will expect decentralization performance to be high if decentralization process

[3] River basin decentralization performance measures the level of attaining several original goals of decentralization process. River basin decentralization progress can also be measured by comparing performance before and after decentralization process on key variables.

follows bottom-up process or mutual agreement between central government and local stakeholders. Additionally, we expect decentralization performance to be high if new institutions created through decentralization were built from the existing traditional based organizations. The direction of impact of variables regarding contextual factors and initial conditions, characteristics of central government/basin-level relationships and capacities as well as internal configuration of basin-level institutional arrangements on decentralization performance is similar to the direction of impact of these variables on decentralization process described above.

4 Data Collection, Empirical Specification and Data Analysis

This study uses a case study approach and is based on both primary and secondary data. The units of analysis are the selected river basins, namely the Inkomati basin in South Africa, the Mzingwane basin in Zimbabwe, and the Mozambican portion of the Limpopo basin, which is under the management of ARA-Sul. The data were collected in the three selected river basins using a structured questionnaire[4]. This study employed a non random (purposive) sampling, which consists of selecting respondents in a deliberative fashion in order to achieve certain objectives (Prinsloo, 2008). For example, respondents with best knowledge and experience in river basin decentralization process were deliberately chosen to answer the questionnaire used in this study since the main objective of the study is to access the impact of institutional factors on river basin decentralization process and its performance. This technique is appropriate in case studies where a small sample composed of key informants is selected from the target population (Saunders, Lewis and Thornhill, 2007).

The number of survey respondents varied among the three river basins[5]. In the Inkomati river basin, 25 key informants representing different stakeholder groups were interviewed. The interviewees included the Inkomati catchment management agency senior staffs, agents from the Department of Water Afairs Regional Office in

[4] The questionnaire is composed of five major sections, namely 1) river basin organization identification, 2) river basin characteristics, 3) decentralization process, 4) decentralization performance and 5) basin comparisons. It can be obtained upon request.

[5] The survey respondents were not able to answer all survey questions and therefore, one questionnaire was filled in each basin using data provided by different survey respondents and taken from secondary sources.

Mpumalanga, the Department of Agriculture in Mpumalanga, the local municipalities of Ehlanzeni District and Bushbuckridge, the Bushbuckridge Water Board, a private water and sewerage services company: Silulumansi-Sembcorp, the South African Local Government Association (SALGA), Irrigation Boards and Water User Associations (WUAs). Emerging farmers and other farmer organizations were also interviewed. Other industry players like, Tsb Sugar, Eskom and mining companies like Fairview mine which is part of Barberton mines were also interviewed. This ensured both spatial coverage as well as demographic and socio economic diversity of the respondents.

In Mzingwane river basin, the unit of analysis was the water user association. In total, 125 key informants from different water user associations were interviewed out of which 8 questionnaires were discarded on the basis of repeating the same water user association or provision of incomplete information. Finally, in the Limpopo river basin, 21 key respondents were interviewed. The target group interviewed in Limpopo river basin was composed of current and former leaders of the National Directorate of water (DNA), ARA-Sul officials and Water Users Associations. In the three countries, secondary data were collected form different governmental, non governmental and private institutions related to water sector.

Empirical Specification

In this study, we do not apply quantitatively the framework presented above because of the limited number of observation for each variable (one questionnaire was filled in each river basin by combining the answers from different respondents). Different from quantitative approaches, a case study methodology does not estimate the impacts of institutional variables on river basin decentralization process and its performance. It highlights the direction of river basin decentralization process and its performance taking into account the considered institutional variables. In this section, we describe the river basin decentralization process variables (vector D in equations 1 and 2 above) and performance variables (vector P in equation 2 above) as well as institutional economics variables (vectors C, G, I and X in equations 1 and 2 above) and then we describe the methods that are used to analyze the data.

Decentralization process variables: The variables in this category are: (i) the length of decentralization process which is captured by the number of years during which the decentralization took place, (ii) the transaction costs of the decentralization process, which are represented by the number of institutions created or dismantled during decentralization process, (iii) the level of involvement of the river basin stakeholders in the decentralization process, which is indicated by the involvement of local people on the development of water laws and functionality of river basin organizations, (iv) the type of devolution of decentralization process which is represented by if the decentralization process followed a top-down, bottom-up and or mutually desired process.

River basin decentralization performance variables: The river basin decentralization performance variables used in the 3 studied river basins are: (a) the level of accomplishment of the river basin objectives, (b) the degree at which stressed resource conditions have been affecting the river basin stakeholders before and after the decentralization process and (c) the level of authority given to different stakeholders to manage river basin resources before and after the decentralization process.

Contextual factors and initial conditions variables: The variables under this category are: the level of economic development of the country and river basin before decentralization initiative, which can be measured by country's GDP and river basin GDP and revenues, river basin population density, which is captured by number of people at river basin and river basin area, river basin annual surface water, stakeholders' share of river basin resources before decentralization process, which is captured from secondary data, and river basin stakeholders' management capacity before decentralization initiative, which is indicated by river basin human capacity of managing water resources and the existence of capacity building programs for river basin stakeholders.

Characteristics of central government/basin-level relationships and capacities variables: This category includes the following variables: percentage of tariffs remaining at the basin, private sector participation in basin investment, sources of river basin budget, the level of authority of river basin stakeholders on managing river basin resources.

Internal configuration of basin-level institutional arrangements variables: Under this category we use the following variables: (i) river basin organizational structure including the composition of each organ and its function, (ii) information sharing variables within the basin and (iii) mechanisms for dispute resolution variables.

Data analysis

The variables presented above are analyzed qualitatively by using the comparative analysis method. Using this method, data are compared and contrasted with the existing literature. As we mentioned before, the case study approach does not estimate the impact of institutional variables on river basin decentralization process. It highlights the direction of the river basin decentralization process given the institutional factors. Specifically, for analyzing objective one (describe the factors that are potentially related to the development of decentralized river basin management in the three basins), we describe the decentralization process and we highlight its direction given the institutional factors.

As described above, the variables composing the decentralization process (vector D in equations 1 and 2 above) are (i) the length of decentralization process, (ii) the transaction costs of the decentralization process, which is represented by the number of institutions created, dismantled during decentralization process, (iii) the level of involvement of the river basin stakeholders in the decentralization process, and (iv) the type of devolution of decentralization process. For each river basin, we assign a value of 0 or 1 for each of the four variables presented above. Each variable takes a value of 1 if its results contribute for a creation of decentralized river basin and 0 otherwise. The overall level of river basin decentralization process is obtained by adding the scores assigned to the four considered variables. Consequently the level of decentralization process increases in our analysis from 0 to 4.

Similarly, in order to reach objective two (depict the factors that are potentially related to the performance of decentralized river basin management in the three countries), first we create the river basin decentralization performance indicators for the three river basins

using river basin decentralization performance variables. The variables composing the decentralization performance (vector P in equation 2 above) are (a) the level of accomplishment of the river basin objectives, (b) the degree at which stressed resource conditions have been affecting the river basin stakeholders before and after the decentralization process and (c) the level of authority given to different stakeholders to manage river basin resources before and after the decentralization process. For each river basin, we assign a value of 0 or 1 for each of the three variables presented above. Each variable takes a value of 1 if its results contribute for the increase of river basin performance and 0 otherwise. The overall level of river basin decentralization performance is obtained by adding the scores assigned to the three considered variables. Therefore, the level of decentralization performance increases in our analysis from 0 to 3.

5 Results

This section compares the experiences of decentralization process and performance of the three river basins. We first discuss decentralization process followed by decentralization performance.

Decentralization Process

Table 1 below presents the results of decentralization process of the three river basins. Specifically, table 1 summarizes the results regarding (i) the length of decentralization process, (ii) the transaction costs of the decentralization process, which is represented by the number of institutions created, dismantled during decentralization process, (iii) the level of involvement of the river basin stakeholders in the decentralization process and (iv) the type of devolution of decentralization process for the three river basins.

The length of decentralization process: Table 1 below shows that all basins have implemented decentralization process and the number of years that decentralization has been underway varies in the three river basins. The length of time needed to complete a decentralization process is difficult to establish. Blomquist, Dinar and Kemper (2005) report that adequate time is needed to adjust changes and stabilize the decentralization process. Hence, all basins are assigned a value of 1.0 (see the number within parenthesis

in the first line of table 1) because all of them have been under decentralization for more than 5 years.

Number of institutions created, dismantled during decentralization process: Table 1 reveals that decentralization has created local level institutions in the three river basins and therefore, all basins are assigned the value of 1.0.

The level of involvement of the river basin stakeholders in the decentralization process: Table 1 show that the level of involvement of river basin stakeholders in river basin decentralization process varies among the three river basins. River basin stakeholders are more involved in decentralization process in Inkomati river basin compared to Mzingwane and Limpopo river basins. The involvement of river basin stakeholders in decentralization process is weak in Mzingwane and Limpopo river basins. Therefore, Inkomati river basin is assigned a value of 1.0 while the other basins are assigned the value of 0.0.

The type of devolution of decentralization process: Inkomati is assigned a value of 1.0 while the other basins are assigned the value of 0.0 since Inkomati river basin followed a bottom-up approach while other basins followed a top-down approach.
The strengths of decentralization process in all basins are supported by the creation of catchment management agencies. The positive outcomes of Inkomati river basin decentralization process might be associated with the type of devolution (bottom-up process towards mutually desired process) followed in the decentralization process. Blomquist, Dinar and Kemper (2005) report that stakeholders' participation is key factor associated with the level of decentralization. The level of decentralization process is more likely to increase in settings where local people participate in decentralization initiative.

However, the Inkomati river basin has not yet been fully decentralized. This fact is supported by the existence of only two water user associations which are not fully operational out of 27 irrigator boards that are supposed to be transformed to Water User Associations. Additionally, the weaknesses of decentralization process in Inkomati river

basin might be explained by the lack of financial resources managed by the river basin organizations since water tariffs are still collected by the Regional Office of Water Affairs. Dinar et al. (2007) report that river basins with financial autonomy are likely to be more decentralized than river basins without financial autonomy.

The attempt to decentralized Mzingwane river basin seems to have resulted in deconcentration. This is because Mzingwane river basin organizations such as Zimbabwe National Water Authority (ZINWA), Catchment and Sub-Catchment are mainly government controlled rather than local stakeholders' based organizations. The type of devolution (top down approach), the lack of involvement of river basin stakeholders in basin management as well as limited financial resources are more likely to be associated with the realized outcomes of Mzingwane river basin decentralization process.

Similar to Mzingwane river basin, the attempt to decentralize Limpopo river basin seems to have resulted in deconcentration. This is because Limpopo river basin organizations such as Limpopo river basin management unity (UGBL), Chokwe Hydraulic Public Enterprise HCEP and Baixo Limpopo Irrigation Scheme BLIS are mainly government controlled rather than local stakeholders' based organizations. The institutional factors that might be associated with the outcome of Limpopo river basin decentralization process might be the lack of involvement of local stakeholders on the development of local organizations and the lack of financial resources to be used for the management of river basin resources at basin level.

Table 1. Summary of Decentralization Process in the Three River Basins

Decentralization process	Inkomati River Basin	Mzingwane River Basin	Limpopo River Basin
Length of decentralization process (years)	7 (1.0)	11 (1.0)	18 (1.0)
Institutions created, dismantled during decentralization process	Decentralization created Inkomati Catchment Management Agency and two water user associations (Elands and Upper Komati). Twenty five irrigation boards are in process to be dismantled and to become Water User Associations. (1.0)	Decentralization dismantled the Department of Water and Development including its local representations and created and created Ministry of Water Resources and Rural Development, ZINWA, Catchment and Subcachment councils as well as water user associations. (1.0)	Decentralization created Directorate for water and national water agencies at national level and created GBL, HICEP, BLIS and Water user associations at local level. (1.0)
Level of involvement of the river basin stakeholders in the decentralization process	Local stakeholders are involved in decentralization process. Examples include the involvement of commercial farmers and other stakeholders in drafting water laws as well as the diversity in the composition of ICMA board. (1.0)	Local stakeholders are not involved in decentralization process. Examples include the creation of ZINWA that was solely made by the government and the selection of stakeholders to river basin organization boards that are mainly performed by ZINWA and the government. (0.0)	Local stakeholders are not involved in decentralization process. Examples include the creation of ARA-Sul that was solely performed by the government and the selection of stakeholders to boards of basin level organizations (HICEP, BLIS, and UGBL) that is mainly performed by the central government. (0.0)
Type of devolution of decentralization process.	Bottom-up (1.0)	Top-down (0.0)	Top-down (0.0)

Note: The number within parenthesis represents the score assigned for each decentralization process variable. Each variable takes a value of 1.0 if its results contribute for a creation of decentralized river basin and 0.0 otherwise.

Decentralization Performance

Table 2 below presents the summary of results of decentralization performance. Specifically, table 2 summarizes (a) the level of accomplishment of the river basin objectives, (b) the degree at which stressed resource conditions have been affecting the river basin stakeholders before and after the decentralization process and (c) the level of authority given to different stakeholders to manage river basin resources before and after the decentralization process for the three river basins.

The level of accomplishment of the river basin objectives: the results presented in table 2 indicated that Inkomati and Mzingwane river basins have reached partially the river basin organization (RBOs) objectives while in Limpopo river basin the level of accomplishment of RBOs objectives is unknown. These results suggest a value of 1.0 for Inkomati and Mzingwane river basins and 0.0 for Limpopo river basin. As mentioned in the data analysis section, the value of 1.0 is assigned in Inkomati and Mzingwane river basins because the accomplishment of some RBOs objectives contributes to an increase in the performance of the decentralization process of these basins.

Regarding the degree at which stressed resource conditions have been affecting the river basin stakeholders before and after the decentralization process, all basins have improved the conditions of stressed river basin resources. However, decentralization of Mzingwane and Limpopo river basins has worsened the conditions of some stressed basin resources such as land degradation and river ecology. This outcome put the Mzingwane and Limpopo river basin lagging behind in performance indicator comparing to Inkomati river basin. Hence, Inkomati river basin is assigned a value of 1.0 while each of the two basins (Mzingwane and Limpopo) are assigned a value of 0.0.

Table 2. Summary of Decentralization Performance in the Three River Basins.

Decentralization Performance	Inkomati River Basin	Mzingwane River Basin	Limpopo River Basin
Degree of accomplishment of original objectives of river basin decentralization process	The RBOs have the following objectives: improve water scarcity and water conflicts as well as assuring water quality. Decentralization process improved by 25% the problems related to water scarcity and conflicts and by 50% the problems related to water quality. (1.0)	The RBOs have the following objectives: reduce water conflicts and improve equitable allocation of water permits. Decentralization decreased water conflict problem by 75% and did not improve water allocation. (1.0)	The RBOs have the following objectives: improve water allocation and distribution and crop production. The level of achievement of these objectives is unknown. (0)
Comparing of the level of problems related to river basin stressed resources before and after decentralization process.	Decentralization initiative did not change the state of problems related to water scarcity, floods, environmental quality, land degradation (erosion, salinity, etc) and river ecology but improved the availability of water and reduced water conflicts. (1.0)	Decentralization process decreased the problems related to water scarcity, water conflicts and water conservation and storage and increased problem related to river ecology and land degradation. (0.0)	Decentralization improved availability of water and increased problems related to land degradation and water conflicts. (0.0)
Level of authority given to different stakeholders to manage river basin resources before and after the decentralization process	Responsibilities regarding water administration, water quality enforcement and water quantity management are equally shared by both local organizations and government agencies after the implementation of decentralization process. Decentralization initiative did not improve the participation of local organization in management of infrastructure financing and setting water quality standards. Management activities related to awarding water rights, water allocation, modeling and forecasting water availability, monitoring and enforcing water quality and collecting water tariffs are performed by Regional Office of the Department of Water Affairs. (1.0)	Responsibilities regarding water administration are performed by both local government (25%) and local river basin organization (75%). Decentralization initiative did not improve the participation of local organization in management of infrastructure financing, water quality enforcement and setting water standards. Decentralization changed water rights to two years renewable water permits. Management activities regarding to water allocation, modeling and forecasting water availability, monitoring and enforcing water quality and collecting water tariffs are performed by ZINWA. (1.0)	Management activities related to infrastructure financing, water quality enforcement and setting water standards are performed by central government. After decentralization, management activities related to water administration are performed by local government (25%) and river basin organizations (75%). (1.0)

Note: The number within parenthesis represents the score assigned for each decentralization performance variable. Each variable takes a value of 1.0 if its results contribute to an increase in performance of decentralization process and 0.0 otherwise.

Concerning the level of authority given to different stakeholders to manage river basin resources, river basin decentralization has allowed river basin organizations of the three basins to be involved in the management of basin resources and mainly water administration. Infrastructure financing, water quality enforcement and collection of water tariffs are sill being performed by government in the three river basins. These results indicate that decentralization of these basins has been increasing its performance since local RBOs are now responsible for the management of some river basin activities and therefore all basins are assigned a value of 1.0.

Table 3 below presents the overall score measuring the decentralization process and performance of the three studied river basins.

Table 3. Level of Decentralization Process and Performance of the Three River Basins

River Basins	Decentralization Process	Decentralization Performance
Inkomati	4	3
Mzingwane	2	2
Limpopo	2	1

The results in the table 3 above show that the overall evaluation of decentralization process result with a value of 4.0 for Inkomati river basin and 2.0 for Mzingwane and Limpopo river basins. Table 3 also shows that Inkomati river basin is performing better (overall score of 3.0) comparing to Mzingwane and Limpopo river basins. Mzingwane river basin is performing better (overall score of 2.0) than Limpopo river basin (overall score of 1.0).

This is supported by the existence of government commitment into decentralization in Inkomati river basin. Chibwe (2011) reports that Inkomati CMA has been receiving funds from the government to implement river basin activities which is not evidently happening in Mzingwane and Limpopo river basins. The better performance of Inkomati and Mzingwane river basin compared to Limpopo river basin is supported by the accomplishment of some river basin activities in these basins. Chibwe (2011) and Musinake (2011) report that the stakeholders of Inkomati and Mzingwane river basins have developed catchment plan while the stakeholders of Limpopo river basin has not yet accomplished a major river basin activity.

6 Conclusions, Limitations of the Study and Policy Implications

This study shows that attempts to decentralize river basin management have been demonstrated in Inkomati, Mzingwane and Limpopo river basins. These attempts are supported by the ratifications of water laws, which have created river basin level institutions (organizations and other mechanisms) to manage river basin. Examples of local level organizations include the Inkomati Catchment Management Agency in the Inkomati river basin, the Zimbabwe National Water Authority in the Mzingwane river basin and the Limpopo River Basin Management Unity in the Limpopo river basin. Examples of mechanisms which facilitate the management of river basin management is the existence of systems for information sharing among stakeholders which are commonly performed using basin meetings.

One important finding from the study is that, none of the studied river basins can be considered fully decentralized. The decentralization processes vary among the studied river basins. While the Inkomati river basin is more decentralized, the process is lagging behind in the Mzingwane and Limpopo river basins. Institutional factors seem to be the key drivers of these differences. The positive outcomes of the Inkomati river basin decentralization process are linked to the type of devolution (mutually desired process) followed in the decentralization process, which resulted in the involvement of local stakeholders. The lower outcomes of decentralization process in the Mzingwane and Limpopo river basins are associated with the type of devolution (top down approach), which resulted in the lack of involvement of river basin stakeholders.

Similar to decentralization process, the results regarding the performance of the decentralization initiatives in the three river basins is mixed. Although river basin organizations of the three river basins do not have financial management autonomy, the Inkomati river basin seems to be performing better comparing to other basins and the Mzingwane river basin seems to perform better than the Limpopo river basin. Participation of stakeholders in the management of river basin resources has been the crucial factor determining these differences. It is important to note that the establishment of participatory mechanisms in decision making involves shifting power from central government to the basin level. Country governments of the studied river basins have showed willingness to have decentralized river basin management. However concentration of power seems to be the key factor that negatively impacted the performance of the studied river

basins. Efforts of Zimbabwean government to manage Mzingwane river basin through concentrating power on Zimbabwe Water Authority (ZINWA) and the endeavor of Mozambican government to concentrate power on the river basin organizations (UGBL, HCEP, and BLIS) have negatively prevented the participation of local stakeholders on river basin management and consequently conduced the decentralization attempt into deconcentration process.

Finally, it is important to highlight that the process of decentralization reforms requires years, even decades and therefore central governments should be prepared to extend their commitment to reform for many years to come in order to achieve a successful decentralized water resource management.

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